

REMARKS

Claims 1-11 are all the claims pending in the application. Claim 1 has been amended to incorporate the subject matter of claim 3, which has been canceled. Claim 2 has been amended to recite "the first" and "the second" cooling operations. Claims 4-9 have been amended to depend from claim 1 or 2 to correct the improper multiple dependency. Claim 9 has been amended to recite the sheet composition. Finally, claims 2-10 have been amended to replace "characterized in that" with --wherein--.

Entry of the above amendments is respectfully requested.

Initially, the Examiner has indicated that claim 3 is allowable.

I. Response to Rejection of Claim 3 under 35 U.S.C. § 112, second paragraph

Claim 3 is rejected under 35 U.S.C. §112, second paragraph, as allegedly being indefinite. Claim 3 has been canceled, and thus withdrawal of the rejection is respectfully requested.

II. Response to Rejection of Claims 1, 2, and 4-11 under 35 U.S.C. § 103(a)

Claim 1, 2, and 4 to 11 are rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Funakawa et al. (US Patent 6,171,413).

Without acquiescing the merits of the rejection, claim 1 has been amended to incorporate the subject matter of claim 3. Accordingly, it is respectfully submitted that Funakawa fails to disclose, teach or suggest a process for manufacturing bake hardening steel sheet comprising: the smelting of a steel, the composition of which comprises, expressed in % by weight:

$$\begin{aligned}0.03 &\leq C \leq 0.06 \\0.50 &\leq Mn \leq 1.10 \\0.08 &\leq Si \leq 0.20 \\0.015 &\leq Al \leq 0.070 \\N &\leq 0.007 \\Ni &\leq 0.040 \\Cu &\leq 0.040 \\P &\leq 0.035 \\S &\leq 0.015 \\Mo &\leq 0.010 \\Ti &\leq 0.005\end{aligned}$$

it being understood that the steel also contains boron in an amount such that:

$$0.64 \leq \frac{B}{N} \leq 1.60$$

the balance of the composition consisting of iron and impurities resulting from the smelting; the casting of a slab of this steel, this slab then being hot rolled in order to obtain a sheet, the end-of-rolling temperature being above that of the Ar3 point; the coiling of said sheet at a temperature of between 500 and 700°C; then the cold rolling of said sheet with a reduction ratio of 50 to 80%; a continuous annealing heat treatment which is carried out for a time of less than 15 minutes; and a skin pass which is carried out with a reduction ratio of between 1.2 and 2.5%, wherein the continuous annealing heat treatment comprises a first cooling operation comprising a slow first part carried out at a rate of less than 10°C/s, followed by a rapid second part carried out at a rate of between 20 and 50°C/s.

In addition, each of claims 2 and 4-11 depend from claim 1, and thus it is respectfully submitted that these claims are patentable over Funakawa.

In view of the above, withdrawal of the rejection is respectfully requested.

III. Response to Rejection of Claims 9-11 under 35 U.S.C. § 103(a)

Claims 9 to 11 are rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over JP 2002-12920 (JP '920).

Applicants respectfully traverse the rejection.

Claim 9 recites a bake hardening sheet obtained by the process as claimed in claim 1, wherein the sheet has a composition comprising, expressed in % by weight:

$$\begin{aligned}0.03 &\leq C \leq 0.06 \\0.50 &\leq Mn \leq 1.10 \\0.08 &\leq Si \leq 0.20 \\0.015 &\leq Al \leq 0.070 \\N &\leq 0.007 \\Ni &\leq 0.040 \\Cu &\leq 0.040 \\P &\leq 0.035 \\S &\leq 0.015 \\Mo &\leq 0.010 \\Ti &\leq 0.005\end{aligned}$$

it being understood that the steel also contains boron in an amount such that:

$$0.64 \leq \frac{B}{N} \leq 1.60$$

the balance of the composition consisting of iron and impurities and has a yield strength of between 260 and 360 MPa, a tensile strength of between 320 and 460 MPa, a BH2 value of greater than 40 MPa and a yield plateau of less than or equal to 0.2%.

Although JP '920 discloses an example where properties are within the recited values, such as the BH value is above 40 (e.g., Examples 13, 22, and 23), the composition of Examples 13 (B) and 23 (L) do not contain any boron, the composition of Examples 22 (K) and 23 (L) do not contain enough Si (i.e., the amount is outside the claimed range), and Example 22 (K) does not contain enough C (i.e., the amount is outside the claimed range).

Accordingly, it is respectfully submitted that JP '920 does not disclose, teach or suggest the claimed sheet according to claim 9.

In addition, claims 10-11 depend from claim 9, and thus it is respectfully submitted that these claims are patentable for at least the same reasons as claim 9.

In view of the above, withdrawal of the rejection is respectfully requested.

IV. Response to Rejection of Claims 1, 2, and 4-11 under 35 U.S.C. § 103(a)

Claims 1, 2 and 4 to 11 are rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over WO 02/059384 (WO '384) in view of EP 0 870 848 (EP '848).

Applicants respectfully traverse the rejection.

Initially, claim 1 has been amended to incorporate the subject matter of claim 3, which has been indicated as being allowable. Thus, WO '384 and EP '848 do not disclose, teach or suggest the present invention according to claim 1.

In addition, WO '384 deals with high strength steel obtained by batch annealing. This kind of annealing is a discontinuous one, carried out for very long times inside annealing installations with a controlled atmosphere. WO '384 describes, on page 9 lines 1-5, a batch annealing of 7 hours, under hydrogen atmosphere, followed by a slow cooling for 30 hours. The purpose of such a long and costly treatment is not only to recrystallize the steel but also to modify its internal structure. One of this modification concerns the solid solution elements like carbon and nitrogen, which will be precipitated during a batch annealing process, but not during a continuous annealing process of a short duration.

This internal structure transformation modifies deeply the characteristics of the obtained steel. The steel of WO '384 has no bake hardening effect, as all carbon and nitrogen have been carefully precipitated. This is especially stressed in WO '384, where it is stated that the purpose of the invention is to obtain a steel showing no aging effect during baking of the coating; "aging" meaning "hardening" in the context of WO '384.

On the contrary, it is essential for the bake hardening steel (BH steels) according to the present invention to contain carbon in solid solution. That is to have carbon in an unbounded, non-precipitated state. Thus, in the present invention, a batch annealing is not replaced by

continuous annealing of the same steel to obtain equivalent steels but in developing a completely different steel compared to WO '384.

Accordingly, WO '384 does not disclose, teach or suggest the claimed method according to claim 1.

Further, with respect to claim 11, the piece is baked below 200°C in order to treat the metal itself and not to bake the paint. In WO '384, the piece is coated with a curable resin which has to undergo curing treatment at 250°C to bake the coating, but not to modify the metal as the purpose of the invention is to provide a metal which will not be modified during that treatment.

As the purposes and composition of WO '384 and the present invention differ, it would not have been obvious for one of ordinary skill in the art to take the steel of WO '384 and to modify the manufacturing process to arrive at the claimed process or to obtain the claimed bake hardening steel.

Moreover, EP '848 does also not deal with a BH steel and must moreover contain a lot of niobium. It is clearly indicated on page 3, lines 9-12 of EP '848 that niobium combines with carbon and nitrogen to form precipitates. Therefore, this steel does not contain unbound carbon (also called "free carbon" or "solid solution carbon" or C*).

Accordingly, even if WO '384 and EP '848 were somehow combined, the combination would not result in the present invention, particularly since neither of the cited references relates to BH steels.

For at least the foregoing reasons, it is respectfully submitted that claims 1 and 9 are not disclosed, taught or suggested by the cited art, and thus are patentable over the cited art.

In addition, each of claims 2 and 4-8 depend from claim 1, and thus it is respectfully submitted that these claims are patentable for at least the same reasons as claim 1.

In view of the above, withdrawal of the rejection is respectfully requested.

V. Conclusion

For the foregoing reasons, reconsideration and allowance of claims 1-2 and 4-11 is respectfully requested.

If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

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